CLAIMS

We claim:

1. A catalyst structure for Fischer-Tropsch synthesis, comprising:

said catalyst structure having a first porous structure with a first pore surface area and a first pore size of at least about 0.1 μm;

a porous interfacial layer with a second pore surface area and a second pore size less than said first pore size, said porous interfacial layer placed upon said first pore surface area;

a Fischer-Tropsch catalyst selected from the group consisting of cobalt, ruthenium, iron, rhenium, osmium and combinations thereof placed upon said second pore surface area.

2. The catalyst structure as recited in claim 1, wherein said porous structure has a geometry selected from the group of foam, felt, wad and combinations thereof.

3. The catalyst structure as recited in claim 1, wherein said porous structure is of a material selected from the group consisting of metal, ceramic and combinations thereof.

4. The catalyst structure as recited in claim 1, wherein said porous interfacial layer is selected from the group consisting of γ-Al_2O_3, SiO_2, ZrO_2, TiO_2, magnesium oxide, vanadium oxide, chromium oxide, manganese oxide, iron oxide, nickel oxide, cobalt oxide, copper oxide, zinc oxide, molybdenum oxide, tin oxide, calcium oxide, aluminum oxide, lanthanum series oxide(s), zeolite(s) and combinations thereof.

5. The catalyst structure as recited in claim 1, placed in a reaction chamber having walls defining a microchannel through which pass reactants.

6. The catalyst structure as recited in claim 5, wherein said walls separate said reaction chamber from at least one cooling chamber.

7. The catalyst structure as recited in claim 1, further comprising a buffer layer between said porous structure and said porous interfacial layer.

8. The catalyst structure as recited in claim 7, wherein said buffer layer is selected from the group consisting of Al_2O_3, TiO_2 , SiO_2, and ZrO_2 and combinations thereof.

9. The catalyst structure as recited in claim 7, wherein said buffer layer includes a sublayer of titania for adhering said gamma-alumina to said porous structure.

10. A method of Fischer-Tropsch reaction, comprising the steps of:

(a) providing a catalyst structure having a first porous structure with a first pore surface area and a first pore size of at least about 0.1 μm;

a porous interfacial layer with a second pore surface area and a second pore size less than said first pore size, said porous interfacial layer placed upon said first pore surface area;

a Fischer-Tropsch catalyst selected from the group consisting of cobalt, ruthenium, iron, rhenium, osmium and combinations thereof placed upon said second pore surface area; and

(b) passing a feed stream having a mixture of hydrogen gas with carbon monoxide gas through said catalyst structure and heating said catalyst

structure to at least 200 °C at an operating pressure, said feed stream having a residence time within said catalyst structure less than 5 seconds, thereby obtaining a product stream of at least 25% conversion of carbon monoxide, and at most 25% selectivity toward methane.

11. The method as recited in claim 10, further comprising the step of reducing said operating pressure and decreasing selectivity toward methane.

12. The method as recited in claim 10, further comprising cooling said product stream.

13. The method as recited in claim 12, wherein said cooling is with a cooling chamber in thermal contact with said catalyst structure.

14. A method of making a Fischer-Tropsch catalyst structure, comprising the steps of:

providing a catalyst structure having a first porous structure with a first pore surface area and a first pore size of at least about 0.1 μm;

depositing a porous interfacial layer with a second pore surface area and a second pore size less than said first pore size, upon said first pore surface area;

placing a Fischer-Tropsch catalyst selected from the group consisting of cobalt, ruthenium, iron, rhenium, osmium and combinations thereof upon said second pore surface area.

15. A Fischer-Tropsch reactor having the Fischer-Tropsch catalyst structure recited in claim 14.